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(54) Service and Entertainment System

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PATENT

SERVICE AND ENTERTAINMENT SYSTEM

5

BACKGROUND OF THE INVENTION

Field of the Invention

10 The invention relates generally to apparatus for transmitting a plurality of video and audio signals in parallel to each of a plurality of remote terminal units each of which may be located at or near a passenger seat of a passenger vehicle such as an aircraft, a train, a bus, or the like, or at or near a seat in a stadium or theater or the like. More particularly, this invention relates to a service and entertainment system for a  
15 passenger vehicle, a stadium, a theater, or the like having a plurality of seats.

Description of the Prior Art

20 It has been proposed, for example, in U.S. Patent No. 4,584,603, issued April 22, 1986 to Harrison, that video displays be mounted separately on passenger seats of a passenger vehicle, such as an aircraft. In the system of U.S. Patent 4,584,603, a video display is mounted on each of plurality of passenger seats and a  
25 plurality of video signals, video game software signals and flight information signals are transmitted in parallel to these video displays. The video display at each seat selects one of these signals and displays the selected signal.

30 In the system of U.S. 4,584,603, each signal supplied to the video displays is transmitted through a plurality of independent transmission lines (one transmission line for each respective video display). In order to transmit many signals to each display, many  
35 transmission lines are required for each display. Accordingly, the system wiring is very complicated and



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the arrangement of the overall system is also very complicated.

Another aircraft passenger television system, in which video programs can be selected by displays mounted on respective passenger seats, has been disclosed in U.S. Patent No. 4,647,980, issued March 3, 1987 to Steventon, et al. The aircraft passenger television system of U.S. 4,647,980, however, is incapable of two-way signal transmission between a central unit and each of a plurality of remote units mounted on passenger seats, and is incapable of transmitting signals other than video programs from a central unit to a plurality of remote units. The system of U.S. 4,647,980 offers a menu of programs that is too limited for the U.S. 4,647,980 system to be used as a broad-menu service and entertainment system for passengers.

#### SUMMARY OF THE INVENTION

The invention is an improved service and entertainment system for a passenger vehicle, having a simplified arrangement and offering passengers a broad menu of services and entertainments.

In one embodiment, the invention includes:

a head end apparatus comprising means for reproducing video signals, means for reproducing audio signals, means for storing television game software signals, digital encoder means for digitally encoding the audio signals and television game software signals, means for modulating the video signals and the encoded audio signals and television game software signals in channels of different frequency bands, respectively, and means for multiplexing the modulated video signals, audio signals and television game software signals;

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a plurality of terminal units, each provided at a respective one of a plurality of passenger seats, each said terminal apparatus unit including tuner means for receiving and demodulating the multiplexed video signals, audio signals and television game software signals, decoder means for decoding the encoded audio signals and television game software signals, memory means for storing the television game software signals, means for processing the television game software signals, display means, and means for selecting one of the video signals, audio signals and television game software signals; and

cable means for transmitting the multiplexed video signals, audio signals, and television game software signals to the terminal units.

In another embodiment, the invention includes:

a head end apparatus comprising means for generating video and related audio signals, means for generating separate audio signals, memory means for storing television game software signals, digital encoder means for digitally encoding all of said audio signals and said television game software signals, means for modulating said video signals and the output signal of said digital encoder means, and multiplexer means connected to said modulator means for multiplexing the modulated video signals, audio signals, and television game software signals;

a plurality of terminal units each provided at respective one of said passenger seats, each said terminal unit comprising a first tuner means for receiving said video signals, a second tuner means for receiving the audio signals related to said video signals, said separate audio signals, and said television game software signals, a decoder means for decoding the output signal of said second tuner means,

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5 a selecting means for selecting said video and related audio signals, said separate audio signals, or said television game software signals, a display means, an audio output terminal, a volume control means, and a means for processing said television game software signals; and

means for transmitting multiplexed signals from the head end apparatus to the plurality of terminal units.

10 These and other features and advantages of the invention will become apparent from the following detailed description of the preferred embodiments that is to be taken in conjunction with the accompanying drawings, throughout which like references designate like elements and parts.

15

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a circuit block diagram showing the whole arrangement of an embodiment of a service and entertainment system according to the present invention;

20 Fig. 2 is an enlarged front view of a front panel of a selection and display apparatus used in the Fig. 1 embodiment;

25 Fig. 3 is a rear view of two units of the selection and display apparatus of the invention, each mounted on a different passenger seat; and

Fig. 4 is a perspective view of a preferred embodiment of the invention.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

30 Several embodiments of a service and entertainment system according to the present invention will now be described with reference to the attached drawings.

The "transmitting side" (also referred to as the "central control portion" or "central control unit") of

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invention will first be described with reference to Fig. 1.

5 In Fig. 1, reference numerals 1a to 1d designate video tape recorders provided in the transmitting side. The transmitting side may be located in an aircraft crew's room. Video tape recorder 1a is used for an override operation and may be loaded with a cassette tape explaining how to put on a life-jacket or the like. Each of video tape recorders 1b to 1d is loaded with a  
10 cassette tape of a video program such as a movie. Each of video tape recorders 1a to 1d is respectively provided with a terminal V for outputting a reproduced video signal and with terminals L, R and A for outputting reproduced audio signals. In an embodiment  
15 in which video tape recorders 1a to 1d store bi-lingual programs, terminals L and R are used for outputting left-channel and right-channel audio signals in a first language, respectively, and terminal A is used for outputting a monaural audio signal in a second language.

20 Television tuner 2 is provided with a terminal V for outputting a video signal and terminals L and R for outputting the left and right channels of an audio signal, respectively.

25 Still picture reproducing apparatus 3 is capable of reproducing still picture information recorded in a compact disk (CD) ROM, such as maps, an airport guiding drawing, or the like. The still picture reproducing apparatus 3 is provided with a terminal V for outputting a video signal representative of a still picture and a  
30 terminal A for outputting an audio signal associated with the still picture.

Audio reproducing apparatus 4a and audio reproducing apparatus 4b each include three sets of compact disk players (CD players) and tape recorders.  
35 The audio reproducing apparatus 4a, 4b are respectively

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provided with six pairs of terminals L and R for outputting left channel and right channel audio signals.

Controller 5 comprises a microphone 5a, a volume control 5b for adjusting the level of an audio signal received at the microphone 5a, an announce key 5c, an  
5 override key 5d and pause keys 5e to 5g for setting the video tape recorders 1b to 1d into pause mode. Video signals from the respective terminals V of the video tape recorders 1a, 1b and audio signals from the  
10 respective terminals L, R and A of these recorders are supplied to controller 5. Controller 5 is provided with a terminal V for outputting a video signal and terminals L, R and A for outputting audio signals. Usually, the terminals V, L, R and A of the controller 5 output the  
15 video signal supplied from terminal V of the video tape recorder 1b and the audio signals supplied from terminals L, R and A of video tape recorder 1b. However, when the override key 5d is pressed to trigger the override operation, the terminals V, L, R and A of  
20 the controller 5 output the video signal supplied from terminal V of video tape recorder 1a and audio signals supplied from terminals L, R and A of video tape recorder 1a. When the announce key 5c is pressed to initiate the announce operation, an audio signal from  
25 microphone 5a is delivered to the output terminal A of controller 5.

CADA encoders 6 and 7 are of the type used in the conventional cable digital audio/data transmission system (CADA system) disclosed in U.S. Patent 4,684,981  
30 issued August 4, 1987. The CADA encoders are capable of time-division-multiplexing a plurality of digital audio and data signals and transmitting the multiplexed signals over a vacant one channel band width (6 MHz) of a CATV, thus transmitting signals (e.g., music) with  
35 high efficiency without damaging their quality. Each of

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CADA encoders 6 and 7 is provided with an A/D (analog-to-digital) converter and a shift register. The time-division-multiplexing operation is carried out by converting a plurality of audio signals into digital signals in the A/D converter, inputting the digital signals in parallel to the shift register at predetermined locations, and then outputting the digital signals from the shift register in series at a high speed. Not only digital audio signals but also control data and data comprising computer software can be multiplexed by the CADA encoders in this manner.

The audio signals delivered to the output terminals L, R and A of controller 5 are supplied to encoder 6. The audio signals delivered to the output terminals L, R and A of the video tape recorders 1c and 1d are also supplied to encoder 6. The audio signals delivered to the output terminals L and R of the tuner 2 and the output terminal A of the still picture reproducing apparatus 3 are also supplied to encoder 6. The audio signals delivered to the six pairs of output terminals L and R of audio reproducing apparatus 4a and the six pairs of output terminals L and R of audio reproducing apparatus 4b are supplied to encoders 6 and 7 through controller 5.

When one of the override key 5d, the announce key 5c, and the pause keys 5e to 5g of the controller 5 is pressed, the controller 5 generates control data SC<sub>1</sub> having contents corresponding to the pressed key. The control data SC<sub>1</sub> is supplied to the encoder 6.

Encoder 6 has output terminals A to E from each of which a pause control signal is outputted in response to the control data SC<sub>1</sub>. The video tape recorders 1b to 1d and the audio reproducing apparatus 4a and 4b are respectively controlled by the pause signals delivered from the terminals A to E of the encoder 6. More

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specifically, when the override key 5d and the announce key 5c are pressed, the pause control signal is outputted from all of the terminals A to E, so that the video tape recorders 1b to 1d and the audio reproducing apparatus 4a and 4b all enter a pause mode. When the pause keys 5e to 5g are pressed, pause control signals are outputted from output terminals A to C, placing the video tape recorders 1b to 1d into a pause mode, respectively.

10 A master controller 8 is provided. Master controller 8 comprises a computer which controls the overall system, and is preferably located in the cabin of the aircraft. Master controller 8 is connected with a display 81 and a keyboard 82. Master controller 8  
15 generates control data SC<sub>2</sub> (for controlling one or more terminal apparatus units located in the receiving side of the system) in response to a command from keyboard 82 and supplies control data SC<sub>2</sub> to encoder 6. The control data SC<sub>2</sub> may be, for example, data for controlling the  
20 luminance of a display in the terminal apparatus, data for polling the conditions of each passenger seat at which a terminal apparatus is located, or other data. The data can be monitored by the display 81 connected to the master controller 8.

25 Menu data is written in ROM 9a, and a different set of game data is written in each of ROMs 9b to 9h. Each data signal SD read out from the ROMs 9a to 9h (for example, for use with computer software) is supplied to a signal processing circuit 10 in which, for example, an  
30 error correcting code may be added thereto, and is supplied to encoder 7 thereafter.

Control data signals SC<sub>1</sub> and SC<sub>2</sub> are supplied also to the encoder 7 from the encoder 6.

35 A time-division-multiplexed signal SCA<sub>1</sub> emerges from output terminal 0 of encoder 6. Signal SCA<sub>1</sub>

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includes the plurality of digitally converted audio signals generated in encoder 6, and the control data SC<sub>1</sub> and SC<sub>2</sub> supplied to encoder 6. The signal SCA<sub>1</sub> is supplied to a modulator 11f to be amplitude-modulated, preferably by a VSB (vestigial sideband) system.

A time-division-multiplexed signal SCA<sub>2</sub> emerges from an output terminal 0 of the encoder 7. Signal SCA<sub>2</sub> includes the plurality of digitally converted audio signals generated in encoder 7, and the control data (SC<sub>1</sub> and SC<sub>2</sub>) and the signal SD supplied to encoder 7. The signal SCA<sub>2</sub> is supplied to modulator 11g to be amplitude-modulated, preferably by a VSB system.

The video signal delivered to the output terminal V of controller 5 is supplied to modulator 11a. The audio signal delivered to the terminal A of controller 5 is supplied both to modulator 11a and to encoder 6. In modulator 11a, an ordinary television signal is generated by frequency modulating the audio signal and frequency-multiplexing the frequency modulated audio signal with the video signal. This television signal is thereafter amplitude-modulated, preferably by a VSB system.

The video signals delivered to the respective output terminals V of the video tape recorders 1c, 1d, the tuner 2, and the still picture reproducing apparatus 3 are respectively supplied to modulators 11b to 11e to be amplitude-modulated, preferably by a VSB system.

The modulators 11a to 11g modulate the signals supplied thereto in frequency bands chosen so as to prevent cross modulation, such as in every other channel above the 60 channels of the television broadcasting band.

Output signals from the modulators 11a to 11g are supplied to an adder 12 in which they are frequency-multiplexed. The frequency-multiplexed signal

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$S_{MF}$  from the adder 12 is supplied through a signal distributor 13 to one end of a leaky cable 21. Cable 21 serves as a bi-directional signal transmission means. The other end of leaky cable 21 terminates at terminal resistor 22. A coaxial cable whose periphery is spirally indented so as to leak a large amount of signals is suitable for use as cable 21.

The receiving side of the system of the invention will next be described.

Fig. 1 shows terminal apparatus unit 30, of the type that preferably will be mounted on the back of a plurality of passenger seats in an aircraft. Although only one terminal apparatus unit 30 is illustrated in Fig. 1, preferably there will be the same number of units of apparatus 30 as there are passenger seats in the aircraft. The terminal apparatus 30 is provided with an antenna 31 which receives the frequency multiplexed signal  $S_{MF}$  leaking from the leaky cable 21. The frequency-multiplexed signal  $S_{MF}$  received at the antenna 31 is supplied through a signal distributor 32 to a television tuner 33 and a CADA tuner 34. Tuner 33 is capable of selectively receiving channels in the output frequency bands of the modulators 11a to 11e, while the tuner 34 is capable of selectively receiving channels in the output frequency bands of the modulators 11f and 11g. Tuners 33 and 34 are controlled in their channel selections by a selection and display apparatus 35.

Video and audio signals emerging from tuner 33 are supplied to the selection and display apparatus 35, and the time-division-multiplexed signal  $S_{CA1}$  or  $S_{CA2}$  emerging from tuner 34 is supplied to a CADA decoder 36. The CADA decoder 36 is constructed so as to effect substantially the inverse operations to those performed in CADA encoders 6 and 7. More specifically, CADA

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decoder 36 decodes the time-division-multiplexed signal SCA1 or SCA2 or CADA data, produces a desired demultiplexed signal, and supplies the same to selection and display apparatus 35 or personal computer 37. An  
5 embodiment of decoder 36 is described in above-referenced U.S. Patent 4,684,981.

Fig. 2 is an example of a preferred arrangement of the panel of selection and display apparatus 35. The  
10 panel of selection and display apparatus 35 may be mounted on the back of a passenger seat, as shown in Fig. 3.

Fig. 2 shows a display 35a, which may comprise a flat cathode ray tube or an LCD (liquid crystal display) or the like, an audio output terminal 35b for connecting  
15 a pair of head phones 35c thereto, and a game terminal 35d for connecting a joy stick 35e or the like (refer to Fig. 1) for playing games.

Further, the selection and display apparatus 35 is provided with a television selecting key 35f, a music  
20 selecting key 35g, a channel display 35h, a channel-down key 35i and a channel-up key 35j.

The television channel can be sequentially changed by first pressing the television selecting key 35f and then pressing the channel-down key 35i or the channel-up  
25 key 35j. Thus, when the channel received by the television tuner 33 is changed sequentially, the display 35a sequentially displays images reproduced from the video signals derived from the video tape recorders 1b to 1d, the tuner 2 and the still picture reproducing  
30 apparatus 3, and corresponding audio signals from CADA decoder 36, are outputted to the audio output terminal 35b. When the audio signal is bi-lingual, two audio channels are assigned for one video display. A first language is outputted from the first channel; and a  
35 second language from the second channel.

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5 The music channel can be sequentially changed by first pressing the music selecting key 35g and then pressing the channel-down key 35i or the channel-up key 35j. In this manner, the audio signal outputted from the CADA decoder 36 is changed, and the audio signals outputted from the audio reproducing apparatus 4a and 4b are sequentially outputted to the audio signal output terminal 35b.

10 The selection and display apparatus 35 is also provided with a menu display key 35k, a cursor-down key 35l, a cursor-up key 35m and an enter key 35n. By pressing the menu key 35k, a video signal based on data from the menu ROM 9a is supplied to the selection and display apparatus 35 from the personal computer 37 and a menu is displayed on the display 35a.

15 By pressing the enter key 35n after selecting a game by moving the cursor on the display with the cursor-down key 35l and the cursor-up key 35m, a video signal and an audio signal based on data of the selected game from the game ROMs 9b to 9h are supplied from the personal computer 37 to the selection and display apparatus 35. Then, the game is displayed on the display 35a and the game sound signal is outputted to the audio output terminal 35b.

20 Selection and display apparatus 35 also includes an attendant call key 35p, a reading light key 35q and a volume control 35r.

25 Referring again to Fig. 1, in response to control data SC1 and SC2 derived from CADA decoder 36, the selection and display apparatus 35 is controlled by a central processing unit (not shown) located within CADA decoder 36. When control data SC1 indicates that the override mode has been selected (this selection is made by depressing the override key 5d of control apparatus 5  
30 located at the transmission side), tuner 33 is tuned to  
35

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5 receive the channel of the output frequency band  
associated with modulator 11a, so that a picture based  
on the video signal produced at output terminal V of  
video tape recorder 1a is displayed on the display  
10 apparatus 35a, while the related audio signal produced  
at output terminal A of video tape recorder 1a is fed to  
audio output terminal 35b. When control data SC1  
indicates that the announce mode has been selected (this  
selection is made by actuating the announce key 5c of  
15 control apparatus 5 located at the transmission side),  
the tuner 33 is also tuned to receive the channel of the  
output frequency band associated with modulator 11a,  
while the audio signal from the microphone 5a is fed to  
audio output terminal 35b. In the announce mode, the  
20 video signal is muted and thus no picture is displayed  
on the display apparatus 35a. In both the announce mode  
and the override mode, the sound volume to all terminal  
units may be controlled so as to remain constant.

20 If CADA encoder 6 or 7 is disabled, the control  
data SC1 obtained is the same as the control data SC1  
generated to initiate the override mode, so that in this  
case also, tuner 33 is forcibly placed in the same  
reception state as that in which it is placed in the  
override mode.

25 In the event that tuner 33 is placed in this  
reception state while a television game is being played,  
execution of the game by personal computer 37 is  
interrupted temporarily.

30 When the announce key 5c is pressed again to  
terminate the override operation or the announce  
operation, selection and display apparatus 35 is  
released from the override condition and is  
automatically returned to its condition as of initiation  
of the override or announce operation. At this point,  
35 personal computer 37 may resume execution of a

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television game. When the selection state (reception state) is overridden (forced into a controlled condition) channel indicator 35h displays a signal indicative of the forced condition. Alternatively, a special  
5 indicator may be provided to perform this function.

On the basis of control data SC2, the brightness of display apparatus 35a is automatically controlled in accordance with the brightness of the cabin. When control data SC2 requests information regarding a  
10 terminal unit, a CPU (not shown) within CADA decoder 36 generates the requested information, which may be indicative of the status of apparatus 35, or data detected by sensors (such as sensor 35) and indicative of whether the seat belts are fastened or not, or  
15 indicative of the reclining states of passenger seats or the like. Such data is supplied to transmitter 38, in which it is modulated by a signal having a selected frequency outside the frequency bands of modulator 11a through 11g. Then the modulated data is supplied through  
20 signal distributor 32 and antenna 31 to leaky cable 21. The signal transmitted by leaky cable 21 is supplied through the signal distributor 13 to the CADA encoder 6 located at the transmitting side, and is fed through CADA encoder 6 to master controller 8, in which it is  
25 utilized.

If the attendant call key 35p of selection and display apparatus 35 is depressed, control data is generated from the CPU of CADA decoder 36. This data is supplied to and modulated by transmitter 38 and the  
30 modulated data signal is then fed through the signal distributor 32 and the antenna 31 to leaky cable 21. The data signal from the leaky cable 21 is supplied through signal distributor 13 to CADA encoder 6 at the transmitting side. On the basis of this data, the CPU  
35 (not shown) within CADA encoder 6 controls a switch box

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41 to light a corresponding attendant call lamp 41 (shown in Fig. 1). If the reading lamp key 35g of selection and display apparatus 35 is actuated, control data is generated from the CPU of the CADA decoder 36. Such data is supplied to the transmitter 38, in which it is modulated and then fed through the signal distributor 32 and antenna 31 to leaky cable 21. The data from the leaky cable 21 is supplied through signal distributor 13 to CADA encoder 6 at the transmitting side. On the basis of this data, the CPU within CADA encoder 6 controls switching box 40 to light a corresponding reading light 42.

Further, if a keyboard 43 is connected to game terminal 35d, as shown by a broken line in Fig. 1, the CPU within CADA decoder 36 produces control data. Such control data is supplied to transmitter 38, in which it is modulated and then fed through the signal distributor 32 and the antenna 31 to the leaky cable 21. The data from the leaky cable 21 is supplied through signal distributor 13 to CADA encoder 6 and is further fed from CADA encoder 6 to master controller 8. When supplied with this data, master controller 8 responds by supplying appropriate computer program data (which may be a word processing program, and will hereinafter be referred to as a word processor program, for specificity) to CADA encoders 6 and 7. This word processor program is then supplied as a frequency-multiplexed signal through the leaky cable 21 to terminal apparatus unit 30 and is then latched into personal computer 37. In this operating mode, if the user enters sentences or other information by operating keyboard 43, such sentences or other information are recorded in a random access memory (RAM) of personal computer 37. Display 35a displays the sentences or other information so that the user can correct them or

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otherwise process them while viewing them on display  
35a. When the correction, or other processing  
operation, is ended using keyboard 43, data representing  
the sentences or other information (converted to ASCII  
code) from the memory of personal computer 37 is  
transmitted through CADA decoder 36 to the transmitter  
38, in which the data is modulated and then fed through  
the signal distributor 32 and the antenna 31 to the  
leaky cable 21. The data from the leaky cable 21 is  
supplied through the signal distributor 13 to the CADA  
encoder 6 in which it is encoded. The encoded data from  
the CADA encoder 6 is supplied to the master controller  
8. The data may then be supplied to a disk drive 44 in  
by which it is recorded, for example, in a floppy disk  
(not shown). Alternatively, the data may be supplied to  
a printer 45 where it is printed out, or the data may be  
transmitted to a remote location via a communication  
apparatus 46. The user can select any one of the disk  
drive 44, the printer 45 and the communication apparatus  
46 by entry of appropriate commands using keyboard 43.  
Such selection commands are supplied to the master  
controller 8 together with the other word processing  
data (such as sentences) entered using keyboard 43. The  
passenger may also utilize any word processor or other  
program which was previously written in a ROM (not  
shown) within personal computer 37. The passenger may  
pick up any record generated in disk drive 44 or any  
paper record generated by printer 45, for example, when  
the passenger exits the aircraft.

According to the embodiment of the invention  
described with reference to Figs. 1-3, video signals  
from the video tape recorders 1a to 1d, the tuner 2 and  
the still picture reproducing apparatus 3, and audio  
signals from the video tape recorders 1a to 1d, the  
tuner 2, the still picture reproducing apparatus 3 and

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the audio reproducing apparatus 4a and 4b, and so on, are frequency-multiplexed (in a time-division manner described in referenced U.S. Patent 4,684,981) and output as signals SCA1 and SCA2 of CADA encoders 6 and 7. These output signals SCA1 and SCA2 are respectively modulated by the modulators 11a to 11g and then added together to form the frequency-multiplexed signal S<sub>MF</sub>. This frequency-multiplexed signal S<sub>MF</sub> is supplied to the leaky cable 21 for transmission to the reception side. Upon reception at each terminal unit 30, the selection and display apparatus 35 may select a desired signal from the plurality of video and audio signals transmitted as the frequency-multiplexed signal S<sub>MF</sub>.

Data generated by actuation of the reading lamp key 35q and the attendant call key 35p, data indicative of the selected status of selection and display apparatus 35 and other data derived from terminal apparatus unit 30, are modulated by transmitter 38 and then supplied through the signal distributor 32 and the antenna 31 to the leaky cable 21. The data from the leaky cable 21 is supplied through the signal distributor 13 to CADA encoder 6. On the basis of this data, the CPU within CADA encoder 6 controls the reading light 42 and the attendant call light 41, for example, to turn each on or off. Alternatively, this data is supplied to master controller 8 in which an audience rating or the like is calculated on the basis of the data supplied.

Fig. 4 shows the appearance of a preferred embodiment of the present invention which is installed in a aircraft. The parts in the Fig. 4 system corresponding to those of Fig. 1 are marked with the same reference numerals and will not be described again in detail. The disk drive 44, the printer 45 and the external communication apparatus 46 shown in Fig. 1 are not shown in Fig. 4 for simplicity. ROMs 9a to 9h and

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signal processing circuit 10 shown in Fig. 1 are all secured in box 100, while CADA encoders 6 and 7, modulators 11a to 11g, adder 12, and signal distributor 13 are all secured in box 200.

5        Since the plurality of video signals, audio signals, and television game software signals to be transmitted by the invention are frequency-multiplexed at the transmission side and supplied through leaky cable 21 to each terminal apparatus unit 30 on the  
10      reception side, the overall arrangement of the invention is simple, and the signal transmission components are particularly simple, compact, and light-weight. This is particularly advantageous in an aircraft which desirably has a low weight.

15        According to the invention, a desired one of a plurality of different video programs, such as movies, digitally reproduced music, and television games can be enjoyed at every passenger seat. The invention is thus suitable for use as a service and entertainment system  
20      for a passenger vehicle (such as an aircraft) having a plurality of passenger seats.

      Further, according to the present invention, since the audio signals are digitized for transmission as digital signals by CADA encoders 6 and 7, each user can  
25      enjoy music having excellent tone quality, which quality is uniform among the terminal units 30 at the reception side.

      While the present invention is useful as an information transmitting apparatus or service and  
30      entertainment system within the cabin of an aircraft as described above, the invention is not limited for use for this purpose, and instead can be implemented in other kinds of passenger vehicles (such as a train or a bus), or in a theater, stadium, or the like.

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While each selection and display apparatus 35 is shown mounted on the rear side of a passenger seat in Figs. 3 and 4, each selection and display apparatus 35 may alternatively be provided at other locations near the user, for example, at the arm portion of the user's seat, or a table portion contained in the user's seat. Alternatively, the selection portion of the terminal apparatus can be provided at the user's arm rest while the display portion is provided on the rear side of the seat ahead of the user.

According to the present invention, since a plurality of video signals and audio signals (and other signals) are frequency-multiplexed and then transmitted through single signal transmitting means, and since the data generated at the reception side is transmitted through the same single signal transmitting means to the transmission side, the system wiring is simple and the hardware for implementing the invention can be simplified. This enhance the suitability of the service and entertainment system of the invention for use as an information transmitting apparatus for a passenger vehicle, or as a service and information transmitting apparatus located within a theater, stadium or the like.

Although several preferred embodiments of the invention have been described, it will be apparent that many modifications and variations could be effected by one skilled in the art without departing from the spirit or scope of the invention, as claimed below.

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WE CLAIM AS OUR INVENTION:

1. A service and entertainment system,  
comprising:

5 a head end apparatus comprising means for  
reproducing video signals, means for reproducing  
audio signals, encoder means for encoding said  
audio signals, means for modulating said video  
10 signals and said encoded audio signals in channels  
of different frequency bands, respectively, and  
means for multiplexing said modulated video  
signals and encoded audio signals, respectively;  
cable means for transmitting said multiplexed,  
15 modulated video signals and encoded audio signals;  
and  
a plurality of terminal units each positioned  
away from the head end apparatus, each said  
terminal unit including a means for selecting at  
20 least one of said multiplexed, modulated video  
signals and encoded audio signals, a tuner coupled  
to the selecting means for receiving and  
demodulating said selected video signals and  
encoded audio signals, a decoder means for  
25 decoding said selected encoded audio signals, a  
display means for displaying the selected video  
signals, and an audio output terminal for receiving  
the selected decoded audio signals.

30 2. A service and entertainment system according  
to claim 1, in which said audio signals are analog audio  
signals and said encoder means converts said analog  
audio signals to digital audio signals prior to encoding  
said audio signals therein, and said decoder means  
35 converts said digital audio signals to analog audio  
signals prior to decoding said audio signals therein.

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3. A service and entertainment system according to claim 1, wherein the head end apparatus also includes means for storing television game software signals, wherein the encoder means is capable of digitally encoding the television game software signals, the modulator means is capable of modulating the television game software signals, and the multiplexing means is capable of multiplexing the modulated television game software signals with the modulated video signals and the modulated audio signals, and wherein the tuner of each terminal unit is capable of receiving and demodulating the multiplexed television game software signals, the decoder means of each terminal unit is capable of decoding the digitally encoded television game software signals, and wherein each terminal unit includes means for storing, processing, and selecting the decoded television game software signals.

4. A service and entertainment system according to claim 3, in which each said terminal apparatus further comprises a game terminal to which a game controller may be connected.

5. A service and entertainment system according to claim 3, in which said selecting means comprises a channel indicator, a set of channel up and down keys for use in selecting any one of said video signals and said audio signals, and a game selecting key for selecting any one of said decoded television game software signals.

6. A service and entertainment system according to claim 5, in which each said terminal apparatus further comprises a volume control for controlling the

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volume of the selected decoded audio signals received at the audio output terminal.

5        7. A service and entertainment system according to claim 6, further comprising an attendant call light and a reading light provided for each said terminal unit wherein said head end apparatus further comprises control means for controlling each said attendant call light, and wherein each said terminal unit comprises an  
10       attendant call key, a reading light key, means for generating a control signal by actuation of said attendant call key and said reading light key, and means for sending said control signal to said control means in said head end apparatus through said cable  
15       means.

8. A service and entertainment system according to claim 7, in which each said terminal unit comprises a panel including said display means, said game terminal,  
20       said channel indicator, said channel up and down keys, said game selecting key, said volume control, said attendant call key and said reading light key.

9. A service and entertainment system according to claim 8, in which at least one of said panels is adapted to be mounted on the rear side of a passenger seat in a passenger vehicle.

10. A service and entertainment system according to claim 8, in which said display means is a flat cathode ray tube.

11. A service and entertainment system according to claim 8, in which said display means is a liquid  
35       crystal display.

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5 12. A service and entertainment system according to claim 2, in which each said terminal unit further comprises antenna means for receiving said multiplexed video signals and audio signals, and a signal distributor connected between said antenna means and said tuner, and each said tuner includes a first tuner for receiving said video signals and a second tuner for receiving said audio signals.

10 13. A service and entertainment system according to claim 2, in which said video signal reproducing means includes a plurality of video cassette recorders and a means for reproducing still video pictures.

15 14. A service and entertainment system according to claim 13, in which said video signal reproducing means further includes a television tuner.

20 15. A service and entertainment system according to claim 13, in which each of said video cassette recorders and said still video picture reproducing means has a video output terminal and an audio output terminal, each said video output terminal being connected to said modulator means and each said audio output terminal being connected to said encoder means.

25 16. A service and entertainment system according to claim 1, in which each said terminal apparatus is mounted at a different passenger seat in a passenger vehicle.

30 17. A service and entertainment system for a passenger vehicle having a plurality of passenger seats, comprising:

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a head end apparatus comprising means for generating video and related audio signals, means for generating separate audio signals, encoder means for encoding all of said audio signals, means  
5 for modulating said video signals and the output signal of said encoder means, and multiplexer means connected to said modulating means for multiplexing the modulated video signals, and the modulated encoded audio signals;

a plurality of terminal units each provided at  
10 respective one of said passenger seats, each said terminal unit comprising selecting means for selecting at least one of said video and related audio signals and said separate audio signals,  
15 first tuner means for receiving said selected video signals, second tuner means for receiving said selected related audio signals and said selected separate audio signals, each of said first tuner means and said second tuner means being coupled to  
20 the selecting means, a decoder means for decoding the output signal of said second tuner means, a display means for displaying the selected video signals, an audio output terminal for receiving the selected audio signals, and a volume control for  
25 controlling the amplitude of the selected audio signals received at the audio output terminal; and means for transmitting said modulated, multiplexed signals from the head end apparatus to  
each said terminal unit.

18. A service and entertainment system according  
30 to claim 17, wherein the head end apparatus also includes means for storing television game software signals, wherein the encoder means is capable of  
35 digitally encoding the television game software signals,

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the modulator means is capable of modulating the television game software signals, and the multiplexing means is capable of multiplexing the modulated television game software signals with the modulated video signals and the modulated encoded audio signals, and wherein the tuner of each terminal unit is capable of receiving and demodulating the multiplexed television game software signals, the decoder means of each terminal unit is capable of decoding the digitally encoded television game software signals, and wherein. each terminal unit includes means for storing, processing, and selecting the decoded television game software signals.

19. A service and entertainment system according to claim 18, in which said transmitting means includes a leaky cable.

20. A service and entertainment system according to claim 18, in which each terminal unit comprises a panel including said selecting means, said display means, said audio output terminal and said volume control.

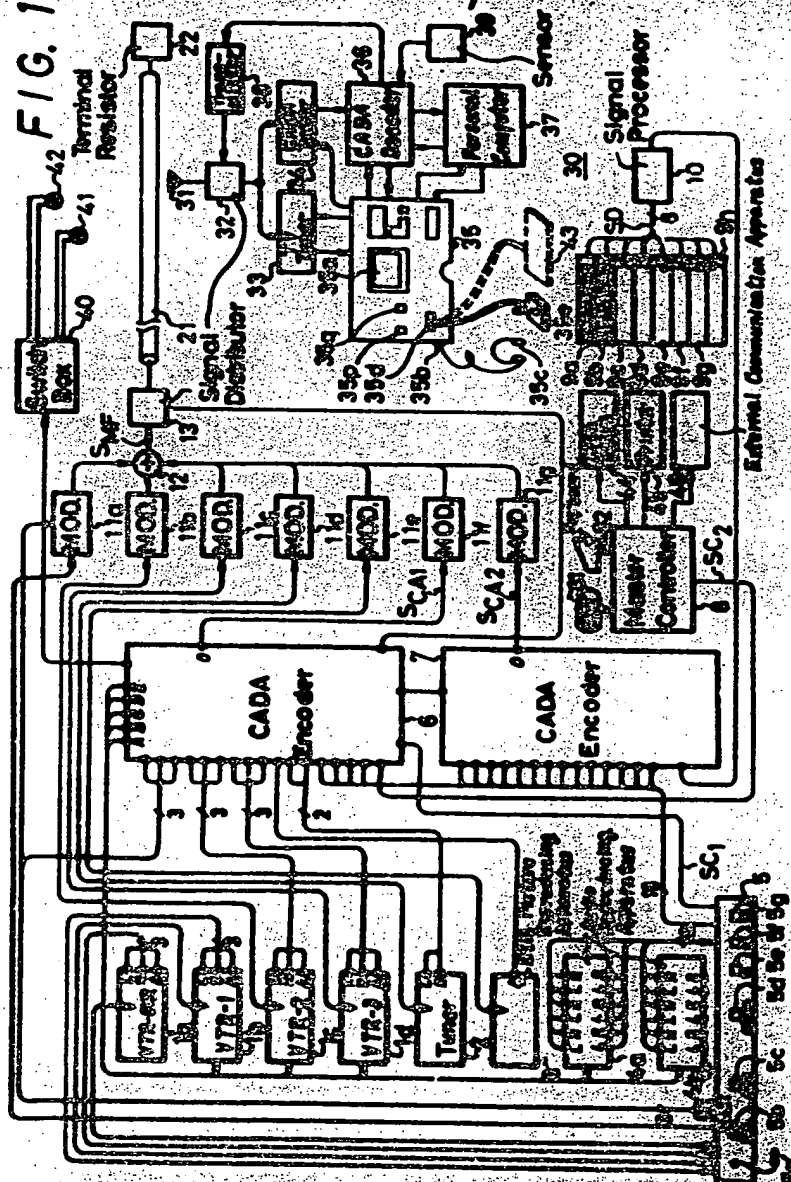
21. A service and entertainment system according to claim 20, in which at least one of said panels is mounted on the rear side of one of said passenger seats.

22. A service and entertainment system according to claim 21, in which said passenger vehicle is an aircraft.



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FIG. 1

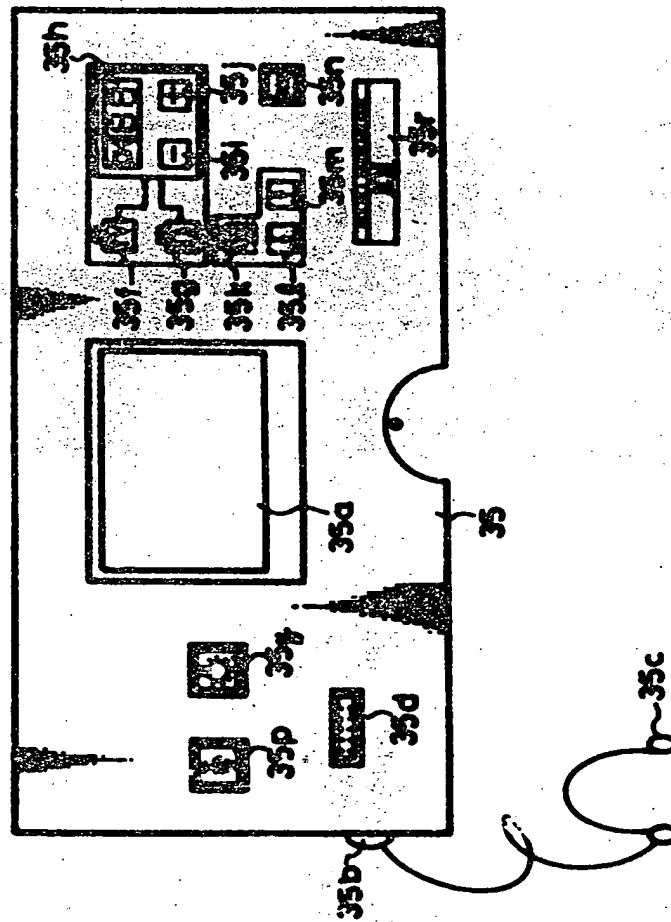


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FIG. 2

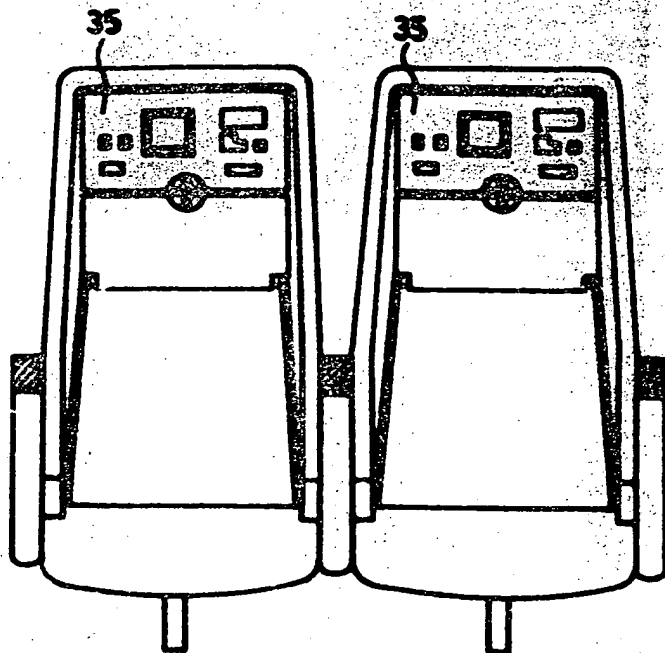


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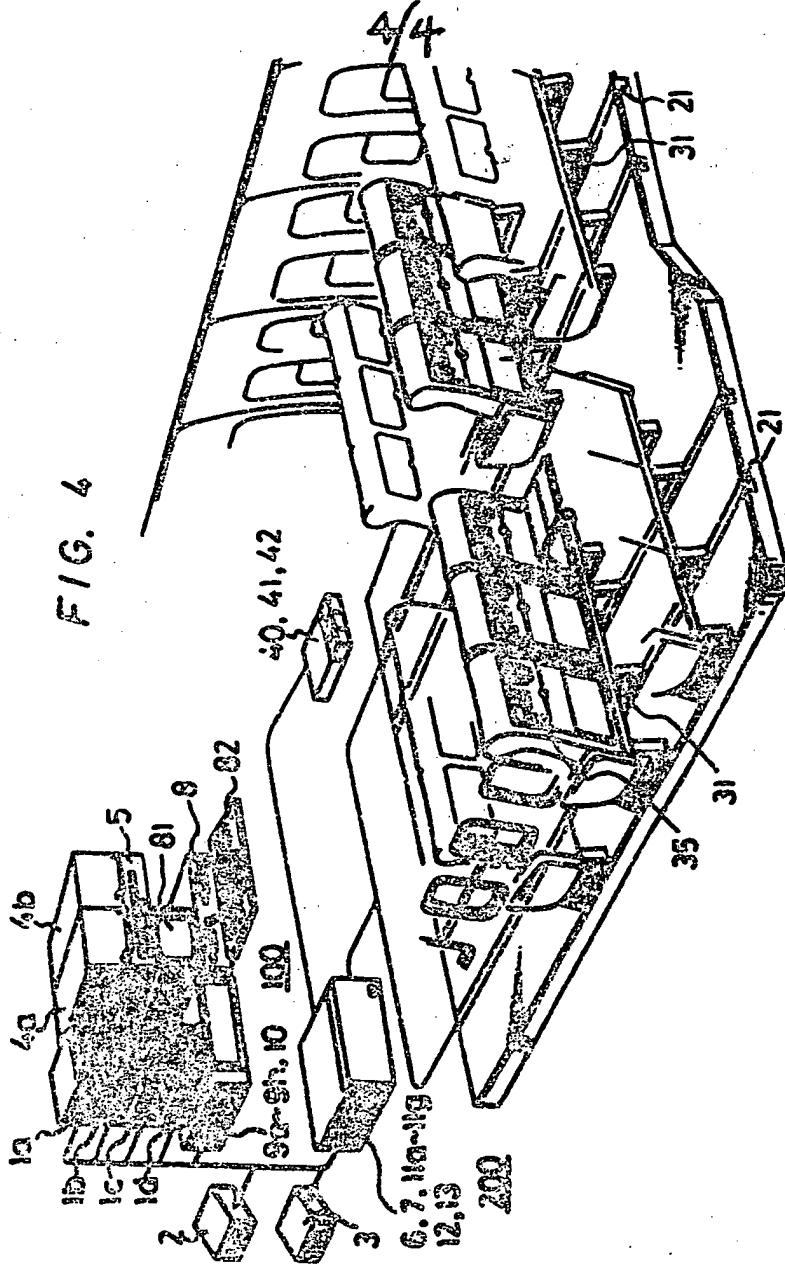
FIG. 3



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FIG. 4



Carroll & Mendenhall